PROLOGUE

Dear Colleague:

This document summarizes the comments provided by the Peer Review Panel at the U.S. Department of Energy Hydrogen Program FY 2005 Annual Merit Review and Peer Evaluation meeting, held on May 23-26, 2005 in Washington, D.C. This was the second review of the entire DOE Hydrogen Program, in response to direction from the Under Secretary for Energy, Science, & Environment. All four Offices that support the President's Hydrogen Fuel Initiative — Energy Efficiency and Renewable Energy (EERE), Fossil Energy (FE), Nuclear Energy, Science, and Technology (NE), and Science (SC) — are participants in the DOE Hydrogen Program and supported this Review. This coordinated effort provides the hydrogen community an overall view of the breadth and depth of DOE's efforts under the Initiative. In addition to the overview presentations given by all four Offices, for the first time projects from FE and NE were presented and peer reviewed. Subsequent to the announcement by Science of approximately 70 hydrogen and fuel cell-related awards in May 2005, we expect to include a significant number of Science projects in our FY 2006 meeting.

The recommendations of the Panel have been taken into consideration by DOE Technology Development Managers and Research Managers in the generation of work plans for FY 2006. The following table lists the projects presented at the Review and the major actions to be taken during the upcoming fiscal year (October 1, 2005 to September 30, 2006). These actions are, of course, subject to the appropriation process as well as Congressional and other priorities. The projects have been grouped according to which activity Program Element (production, delivery, storage, fuel cells, etc.) they support, and the weighted scores are based on a four-point scale involving five criteria. To furnish all principal investigators (PIs) with direct feedback, evaluations and comments are provided to each presenter; however, the authors of the individual comments remain anonymous. The PI of each project is instructed to fully consider these summary evaluation comments, as appropriate, in their FY 2006 planning.

I would like to express my sincere appreciation to the members of the Peer Review Panel. It is they who make this report possible, and upon whose comments we rely to help make programmatic budget decisions for the new fiscal year. Thank you for participating in the FY 2005 Annual Merit Review and Peer Evaluation meeting.

We look forward to your participation in the FY 2006 Annual Merit Review and Peer Evaluation which is presently scheduled for May 16-19, 2006 in the Washington, D.C. area.

Steven G. Chalk
DOE Hydrogen Program Manager
Office of Energy Efficiency and Renewable Energy

MERIT REVIEW AND PEER EVALUATION SUMMARY TABLE

Hydrogen Production and Delivery:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PD-02	*A Reversible Planar Solid Oxide Fuel-Fed Electrolysis Cell and Solid Oxide Fuel Cell for Hydrogen and Electricity Production Operating on Natural Gas/Biogas; MSRI; Greg Tao*	2.78		X			Congressionally-directed competitively awarded project which will continue in FY2006. Focused on DOE goals of improving efficiency and flexibility in hydrogen production from natural gas and renewable resources. A process analysis and well-to-electricity/hydrogen analysis is needed to determine overall efficiency and cost of hydrogen production compared to other pathways.
PD-03	*Autothermal Cyclic Reforming Based Hydrogen Generating & Dispensing System; GE Energy; Ravi Kumar*	3.06		X			Project is nearing completion in early FY2006. Process analysis is in progress to document distributed reforming targets.
PD-04	*Development of a Turnkey Hydrogen Fueling Station; Air Products; David Guro*	3.56		X			Nearing completion in early FY2006. Research on advanced hydrogen steam methane reformer for integration into the hydrogen generation system is complete.
PD-05	*Development of a Natural Gas-to-Hydrogen Fueling System; GTI; Bill Liss*	2.58		X			Behind schedule. Accomplishments unclear. Needs to sharpen focus on distributed generation RD&D targets. Better defined deliverables needed.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PD-06	*Production of Hydrogen by Biomass Reforming; PNNL; David King*	3.13		X			Expand outreach to industry. Quantified milestones and deliverables needed.
PD-07	*Hydrogen Generation from Biomass-Derived Carbohydrates via the Aqueous-Phase Reforming (APR) Process; Virent Energy Sys.; Randy Cortright*	3.21	X				Develop better defined milestones, and coordinate efforts with related projects.
PD-11	*Advanced Hydrogen Transport Membranes for Vision 21 Fossil Fuel Plants; Eltron Res. Inc.; Anthony Sammells*	3.18		X			Add a system engineering model to quantify the cost advantages of proposed work over conventional technologies and to provide R&D guidelines.
PD-12	*Scale-up of Microporous Inorganic Hydrogen-Separations Membranes; ORNL; Brian Bischoff*	3.15	X	X			Add a system engineering study to determine the economic viability of proposed work and establish the go/no-go decision points. Address hydrogen selectivity and clues to improve hydrogen selectivity.
PD-13	*Low Cost Hydrogen Production from Biomass Using Novel Membrane Gasification Reactor; GTI; Francis Lau*	3.07	X				Focus on membrane development and ensure good milestones and go/no-go decision points.
PD-14	*A Novel Slurry-Based Biomass Reforming Process; United Tech. Res.Ctr.; Tom Vanderspurt*	3.05	X				Focus on catalyst development, ensure good go/no-go decision points, and consider adding a catalyst development partner.
PD-15	*Maximizing Photosynthetic Efficiencies and Hydrogen Production in Microalgal Cultures; UC Berkeley; Tasios Melis*	3.48				X	Current project completed successfully (good progress) and follow-on project started. The project approach was thorough and well-thought out including gene identification and function.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PD-16	*Biological Systems for Hydrogen Photoproduction; NREL; Maria Ghirardi*	3.32		X			Good progress over the last year with plans for meaningful future work. Efforts are well-coordinated internally and with other groups.
PD-17	*Creation of Designer Alga for Efficient and Robust Production of H2; ORNL; James Lee*	2.92		X			Before significantly ramping up proton channel efforts, sufficient scientific basis needs to be established and validated by the peer community.
PD-18	*Fermentative Approaches to Hydrogen Production; NREL; PinChing Maness*	3.44		X			Great progress so far on this new project. Plans for the future are reasonable and promising.
PD-19	*Hydrogen Reactor Development and Design for Photofermentation and Photolytic Processes; NREL; Dan Blake*	2.97		X			Need to develop a strategy for gas permeability of polymers.
PD-20	*Photoelectrochemical Hydrogen Production: SHGR Program Subtask; U of Hawaii; Eric Miller*	3.25				X	Project successfully completed with satisfactory progress, potential significant long-term impact, and well established collaboration. Project will be continued under the UNLV High Temperature Solar Congressionally-directed project.
PD-21	*Photoelectrochemical Water Systems for H2 Production; NREL; John Turner*	3.36		X			The project is carefully thought-out and is quite feasible, though risky. In addition, there is a very good mix of experimental results and computational methods for bandgap tailoring.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PD-23	*Low-Cost, High-Pressure Hydrogen Generator; Giner Electrochemical; Cecelia Cropley*	3.26		X			Project making progress on reducing costs to meet DOE goals while addressing potential for high pressure electrochemical compression. Further cost analysis should be utilized to evaluate current performance against DOE goals. In addition project would benefit from additional partners.
PD-24	*High Temperature Solid Oxide Electrolyzer System; INEEL; Steve Herring*	2.88		X			Good progress to date. Unclear how high purity is obtained from 90/10 hydrogen/H_2O outlet stream. Identify future plans and link to DOE goals.
PD-25	*Renewable Electrolysis Integrated System Development and Testing; NREL; Ben Kroposki*	3.71		X			Project addresses system problems inherent in renewable hydrogen generation approaches. This work supports DOE's goals on the implementation of large-scale hydrogen generation from renewables using electrolysis. Project will continue funding in FY2006.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PD-26	*Alkaline, High Pressure Electrolysis; Teledyne; Samir Ibrahim*	2.81		X			Presentation provided comprehensive safety analysis of new alkaline electrolysis system design. Presentation did not identify major cost features and does not identify the critical component developments to improve technology. More extensive hardware results and data are expected in FY2006.
PD-27	*Sulfur-Iodine Thermochemical Cycle; INL/SNL; Paul Pickard*	3.64		X			Highly relevant to program goals and substantially different from other work. Good use of international collaboration. Materials identification critical.
PD-28	*Development of Solar-powered Thermochemical Production of Hydrogen from Water; Univ. of Nevada; Bob Perret*	2.94					This project will be continued as a multi-year Congressionally-directed effort. Emphasis is now being placed on research on the promising thermochemical cycles selected as recommended by the reviewers.
PD-29	*Alternative Thermochemical Cycle Evaluation; ANL; Michele Lewis*	3.06		X			Good complement to higher-risk NHI research. Use of and intended output to similar solar research very positive. Effort is needed to engage industry and universities.
PD-30	*High Temperature Heat Exchanger Development; UNLV; Tony Hechanova*	2.77		X			Project organization (multiple work packages) very confusing with opportunity for better alignment with program. Suggest breaking up into smaller pieces.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PD-31	*NHI System Interface and Support Systems; INL; Steve Sherman*	3.19		X			Link between nuclear reactor and hydrogen production system highly relevant to NE portion of DOE program. Need to clarify progress against stated barriers and industry links.
PD-32	*H2A Delivery Analysis; ANL; Marianne Mintz*	3.45		X			This work will be continued and become part of the expanded hydrogen delivery analysis effort as an industry and national lab collaborative project.
PD-33	*Hydrogen Permeability and Integrity of Hydrogen Delivery Pipelines; ORNL; Zhili Feng*	2.95		X			This project will be continued and the funding level will be increased to a more effective level. This project and the other pipeline research projects will be coordinated and leveraged for synergies as part of the hydrogen delivery pipeline working group.
PD-34	*Reversible Liquid Carriers for an Integrated Production, Storage & Delivery of Hydrogen; Air Products; Guido Pez*	3.25	X				This new unique liquid hydrogen carrier project will be continued with better designed go/no-go decision and direction points to ensure proper emphasis relative to on-board or off-board approaches and targets.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PD-35	*Materials Solutions for Hydrogen Delivery in Pipelines; Secat, Inc.; Subodh K. Das*	3.06	X				This new project will be continued. Clearer objectives, timeline, and milestones will be developed. This project and the other pipeline research projects will be coordinated and leveraged for synergies as part of the hydrogen delivery pipeline working group.
PDP-01	*Enhanced Hydrogen Production Integrated with CO2 Separation in a Single-Stage Reactor; Ohio State Un.; Liang Shih Fan*	2.99		X			Focus work beyond CO_2 sorption to include (a) hydrogen purity, (b) WGS catalyst life stability at high temperature, and c) issues related to the integration of the proposed concept with front end coal gasification step.
PDP-03	*Integrated Ceramic Membrane System for Hydrogen Production; Praxair; Joseph Schwartz*	3.01		X			Continue as novel separation system critical to development of next generation integrated distributed production system.
PDP-04	*Low Cost Hydrogen Production Platform; Praxair; Tim Aaron*	3.07		X			Continue to develop design for manufacturing and assembly techniques. Need to document progress against the DOE targets as the project proceeds.
PDP-05	*Solid Oxide Fuel Cell Carbon Sequestration; Nisource Energy Tech.; Norm Bessette*	2.58		X			Congressionally-directed multi-year project. Need more focus on addressing program technical targets in electrolysis.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PDP-07	*High Pressure Distributed Ethanol Reforming; ANL; Shabbir Ahmed*	2.62		X			Continue as the project is directly relevant to distributed production from renewable feedstocks. Focus on energy balance between reformer and water gas shift viewed as strength.
PDP-08	*Hydrogen Production for Fuel Cells via Reformation of Coal-Derived Methanol; U Cal., Davis; Paul Anders Erickson*	3.10		X			Focus work on the role of hydrocarbon impurities in reforming step and seeking means to reduce reforming catalyst deactivation rate, including the use of guard bed. Expand and seek more active industry participations in the project.
PDP-09	*Hydrogen Production via a Commercially Ready Inorganic Membrane Reactor; Media & Process Tech.; Paul KT Liu*	3.15		X			Address the material/preparation cost and low hydrogen flux associated with the proposed carbon molecular sieve/stainless steel support system. More experimental work to prove out the feasibility of the WGS membrane reactor.
PDP-10	*New York State Hi-Way Initiative; GE Global Research; Richard Bourgeois*	3.19		X			Congressionally-directed project has resulted in new electrolyzer design that shows potential for lower costs and mass production capability. Project will continue funding to advance alkaline electrolysis development.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PDP-14	*Development of Dense Ceramic Membranes for Hydrogen Separation; ANL; Balu Balachandran*	3.40		X			Expand industry participation and collaboration including cost-sharing. Address issues which can integrate proposed work with front-end coal gasification step with high system efficiency. Perform long-term membrane life testing.
PDP-15	*Ceramic Membrane Reactor Systems for Converting Natural Gas to Hydrogen and Synthesis Gas (ITM Syngas); Air Products; Christopher Chen*	3.60		X			DOE/EERE cost-share of commercial scale planar membrane complete. Scale-up to production of liquid fuels and phase III carbon sequestration to be continued in Fossil Energy Program.
PDP-16	*Cost-Effective Method for Producing Self-Supporting Pd Alloy Membrane for Use in the Efficient Production of Coal-derived Hydrogen; SwRI; Bruce Lanning*	3.23		X			More experimental work with better matrix planning to include long life membrane testing and testing with gas mixtures. Perform scoping economics study. Expand industry participation with cost-sharing.
PDP-17	*Defect-Free Thin Film Membranes for H2 Separation and Isolation; SNL; Tina Nenoff*	2.97		X			Continue as critical to lowering cost of hydrogen separation technologies. Focus on real-world experimental results with potential commercialization partners.
PDP-19	*Membrane Applications for Nuclear Hydrogen Production Processes; ORNL; Brian Bischoff*	3.09	X	X			Relevance to NE production technologies clear to some, unclear to others. Higher apparent need for thermochemical membranes than high-temperature electrolysis.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PDP-20	*Materials for High-Temperature Thermochemical Processes; ORNL; Dane Wilson*	3.21		X			Future plans should focus on new materials.
PDP-24	*A Novel Membrane Reactor for Hydrogen Production from Coal; GTI; Francis Lau*	3.21		X			Prove out the feasibility of membranes in the presence of contaminants found in coal gasifier. Improve membrane hydrogen flux. Add dual-phase membrane development work. Seek more inputs from industry.
PDP-25	*Hydrogen Separation; NETL; Richard Killmeyer*	3.26		X			Improve membrane fabrication capability to make thinner membrane to yield higher hydrogen flux. Perform experiments under conditions of commercial interests. Seek more industry inputs to the project.
PDP-27	*Startech Hydrogen Production; Startech Environmental; David Lynch*	2.88		X			Congressionally-directed multi-year project. Needs to focus more on materials and design, expand collaborations, perform thorough energy balance analysis including efficiency of electricity.
PDP-28	*EVermont Renewable Hydrogen Fueling System; Northern Power Sys.; Tom Maloney*	3.03				X	Congressionally-directed project (completed). Developed wind integrated electrolysis system.
PDP-33	*Discovery of Photocatalysts for Hydrogen Production; SRI International; Brent MacQueen*	2.70				X	This project will be completed this year with limited progress or results.
PDP-39	*Hydrogen Production – Increasing the Efficiency of Water Electrolysis; SNL; Donald Pile*	2.41			X		Project discontinued and work in this area will be funded as a partner with industry in a competitive award.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PDP-41	*Hydrogen Generation from Electrolysis; Proton Energy Systems; Stephen Porter*	2.64		X			Future technology development in FY2006 will need to show potential to achieve DOE program electrolysis goals. Primary focus should be on electrolyzer development with diminished emphasis on fueling station aspects of project.
PDP-42	*System Design and New Materials for Reversible Solid-Oxide, High-Temperature Steam Electrolysis; GE Global Research; James Ruud*	2.62	X				New project, will continue in FY2006. Project will be closely collaborated with other reversible solid oxide development at GE.
PDP-45	*Hybrid Sulfur Thermochemical Process Development; SRS; Bill Summers*	3.46		X			Highly relevant to program goals. Effective use of modeling. Large number of collaborators.
PDP-46	*Combined Reverse-Brayton Joule-Thompson Hydrogen Liquefaction Cycle; Gas Equip. Engr. Corp.; Martin Shimko*	2.43	X				This is a new project. The project will be continued. The program cost target will be clarified and a go/no-go decision on cost target feasibility will be made after one year of research.
PDP-47	*Active Magnetic Regenerative Liquefier (AMRL) Development; New Concepts Res. Corp.; Robert Thompson*	3.23	X				This is a new project. This unique approach to hydrogen liquefaction with breakthrough potential for cost reduction and efficiency improvement will be continued. It will be focused primarily on large scale liquefaction and early economics will be developed in detail.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
PDP-48	*Hydrogen Embrittlement of Pipeline Steels: Causes & Remediation; U. of Illinois; Petros Sofronis*	3.21	X				This is a new project providing more fundamental knowledge and insight into hydrogen embrittlement. This project and the other pipeline research projects will be coordinated and leveraged for synergies as part of the hydrogen delivery pipeline working group.
PDP-49	*Hydrogen Regional Infrastructure Program in Pennsylvania; Concurrent Tech. Corp; Eileen Schmura*	2.38		X			Congressionally-directed multi-year project. Need more focus on addressing program technical targets in Delivery Technologies.
PDP-55	*Distributed Bio-Oil Reforming; NREL; Bob Evans*	3.12	X				This project will be continued. Additional reforming catalyst expertise from industry and/or universities will be added to this effort.
PDP-57	*Developing Improved Materials to Support the Hydrogen Economy; Edison Materials Tech Center; Michael Martin*	1.92		X			Congressionally-directed multi-year project. Need more focus on addressing program technical targets.

Hydrogen Storage:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
ST-02	*Development of Metal Hydrides at Sandia National Laboratories; Sandia Nat. Labs ; Jim Wang*	3.05		X			This work is being incorporated into the Metal Hydride Center of Excellence. Increase systems analysis to help guide materials R&D. Consider building teams within the center and collaborate with relevant independent projects.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
ST-03	*Catalytically Enhanced Hydrogen Storage Systems; Univ. of Hawaii; Craig Jensen*	3.17				X	Project ends in FY2005. New materials work will continue as part of the Metal Hydride Center of Excellence. Need to continue the focus on materials with higher capacity than sodium alanate.
ST-04	*High Density Hydrogen Storage System Demonstration Using NaAlH4 Complex Compound Hydrides; UTRC; Don Anton*	2.89		X			Planned for completion in FY2007. Need to communicate system level "lessons learned" and consider collaboration with the Metal Hydride Center of Excellence, Storage Systems Analysis Working Group, and relevant independent projects. Develop new status and projection numbers for weight and volume of the second generation prototype.
ST-05	*Discovery of Novel Complex Metal Hydrides for Hydrogen Storage through Molecular Modeling and Combinatorial Methods; UOP; David Lesch, PI; Adriaan Sachtler, co-PI*	2.90		X			Transition from sodium alanate to higher capacity materials with potential to meet 2010 system targets. Consider collaboration with the Metal Hydride Center of Excellence and other relevant independent projects.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
ST-06	*Complex Hydride Compounds with Enhanced Hydrogen Storage Capacity; UTRC; Don Anton, PI; Susanne Opalka, co-PI*	3.17		X			Improvement since FY2004. Incorporate "lessons learned" from the UTRC system prototype project (ST-04) to guide material selection. The trend to move away from the sodium alanates is appropriate. Consider collaboration with the Metal Hydride Center of Excellence and relevant independent projects.
ST-07	*Sub-Nanostructured Non-Transition Metal Complex Grids for Hydrogen Storage; Cleveland State Univ.; Orhan Talu*	2.06		X			This project was awarded prior to the adoption of the current hydrogen storage performance targets. DOE will work with Cleveland State to prioritize work in FY2006 to stress the proof of concept of hydrogen adsorption/absorption in metal grids.
ST-09	*Clean Energy Research at the University of South Carolina; U. of S. Carolina; Ralph White*	2.18		X			FY2004 Congressionally-directed project (also received FY2005 Congressionally-directed funds). Work on well known materials ($NaAlH_4$, $NaBH_4$) is not likely to meet targets. Reduce duplication of other DOE projects.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
ST-10	*Fuel Cell and Hydrogen Research University of South Florida; U. of South Fl.; Lee Stefanakos*	1.53		X			FY2004 Congressionally-directed project (also received FY2005 Congressionally-directed funds). Diverse portfolio that needs coordination with the rest of the program. Terminate work on approaches that will not meet DOE targets (e.g. Mg_2FeH_6) and focus on novel approaches to meet 2010 targets and with potential to meet 2015 targets.
ST-12	*Process for the Regeneration of Sodium Borate to Sodium Borohydride for Use as a Hydrogen Storage Source; Millennium Cell; Ying Wu*	2.40		X			Collaborating with the Chemical Center of Excellence on a separate effort and will include Rohm and Hass for engineering expertise. Need to determine total energy required and economic feasibility for the system. Improve well-to-tank analysis with a good protocol/mode and evaluate data for go/no-go decision.
ST-13	*Chemical Hydride Slurry for Hydrogen Production and Storage; Safe Hydrogen; Andy McClaine*	2.56		X			Recheck assumptions in systems analyses. Need to build and test system to demonstrate system efficiency and cost. Assess potential hydrogen stream impurities from mineral oil. In FY2006, this project will test the solid-oxide oxygen-ion-conducting membrane (SOM) and carbothermic processes and update economic analyses.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
ST-14	*Development of New Carbon-Based Sorbent Systems for an Effective Containment of Hydrogen; Air Products; Alan Cooper*	3.29		X			Strong project. Conduct early systems analyses to establish minimum molecular target requirements. Continue dehydrogenation catalyst development and the search for materials with improved thermodynamics. Consider potential health effects of carriers. Need to confirm cycling stability.
ST-15	*Low Cost, High Efficiency, High Pressure Hydrogen Storage; Quantum; Jui Ko*	2.96					Expand collaborations (LLNL, ANL, ORNL, carbon manufacturers, etc.). Provide more detailed assessment of CoolFuel™ approach. Implement go/no-go decision points.
ST-16	*Advanced Concepts for Containment of Hydrogen and Hydrogen Storage Materials; LLNL; Salvador Aceves*	2.81					Need to narrow down number of approaches. Focus on second generation tank and test the system to provide experimental data to replace projected capacity values.
ST-17	*Advanced Manufacturing Technologies for Renewable Energy Applications; Natl Center for Manf. Sci.; Chuck Ryan*	1.53		X			FY2004 Congressionally-directed project (also received FY2005 Congressionally-directed funds with work scope still to be finalized). List of goals, milestones, schedule and deliverables should be provided.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
ST-18	*DOE Carbon-based Materials: NREL Activities and Overview; NREL; Mike Heben*	3.20		X			New scope was well received. Continue expansion beyond nanotubes as part of Center of Excellence on Carbon-based Materials. Add go/no-go or downselects for each approach and apply systems analysis to guide material property requirements.
ST-19	*Analyses of Hydrogen Storage Materials and On-Board Systems; TIAX LLC; Stephen Lasher*	2.90					Critical to the program. Coordinate with ANL and Center analysis activities. Work scope needs some parallel tasks, rather than all sequential. Resolve discrepancy between measured values (e.g. UTRC prototype) and system analysis projections. Need to document and communicate assumptions.
ST-21	*Standardized Testing Program for Chemical Hydride and Carbon Storage Technologies; SwRI; Richard Page*	3.04					Validation through round robin testing is critical. Incorporate feedback from Centers and others into protocols. Ensure reproducibility and communicate results to obtain acceptance from technical community.
STP-58	*Development and Characterization of Novel Complex Hydrides; Savannah River NL; Ragaiy Zidan*	2.81		X			This project is a CRADA with UTRC (ST-04), planned for completion in FY2007. Need to focus on materials with higher capacity than sodium alanate.

Fuel Cells:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-02	*Integrated Manufacturing for Advanced MEAs; De Nora; Emory DeCastro*	3.26		X			Reviewers concerned about "manufacturability" of Ion Beam Assisted Deposition coating process. Project has very broad scope. Should begin to focus and down select to allow optimization. Good collaboration and publishing.
FC-03	*Advanced MEAs for Enhanced Operating Conditions, Amenable to High Volume Manufacture; 3M; Mark Debe*	3.61		X			Pt loading meets 2015 target. Reviewers indicate that membrane performance at low RH needs improvement.
FC-04	*Development of High Temperature Membranes and Improved Cathode Catalysts for PEM Fuel Cells; UTC; Lesia Protsailo*	3.29		X			Well thought out and executed catalyst experiments, and down-selects for university work were made intelligently. Need to give some thought to bringing on an MEA manufacturer.
FC-05	*Electrocatalyst Supports and Electrode Structures; LANL; Mahlon Wilson*	2.92		X			Need to reconcile high activity of BNL catalyst with mediocre performance of the catalyst as tested in an MEA at LANL. Catalyst testing protocol needs to incorporate voltage cycling.
FC-06	*Development of New Polymer Electrolytes for Operation at High Temperature and Low Relative Humidity; Case West. Res. Uni.; Tom Zawodzinski*	2.86		X			Good focus on conductive mechanisms for new membrane approaches. Reviewers recommend the use of go/no-go decisions to down select approaches.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-07	*High-Temperature Polymer Electrolyte Membranes; ANL; Debbie Myers*	2.64		X			PI should work on issue of dimensional stability and establish collaborations with membrane suppliers/manufacturers.
FC-08	*Development of Polybenzimidazole-based, High Temperature Membrane and Electrode Assemblies for Stationary and Automotive Applications; Plug Power; Rhonda Staudt*	2.64		X			Project will focus on resolution of fundamental issues. Project should generate performance degradation data versus acid loss and creep of the membrane.
FC-09	*Enabling Commercial PEM Fuel Cells with Breakthrough Lifetime Improvements; Dupont; Gonzalo Escobedo*	3.48		X			Good combination of theory and experimentation. Comprehensive approach that addresses failure modes of the MEA in a systematic way. Mechanical tests may provide some guidance on stability, but they can't fully represent the cyclic stresses in a fuel cell. Good collaboration, but there is a lack of publications for this size project.
FC-10	*New Electrocatalysts for Fuel Cells; LBNL; Phil Ross*	3.40		X			Strength is blend of theory and experiments on model catalysts in the context of operation of real fuel cells. PI should conduct single cell tests with collaborators.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-11	*Non-Precious Metal Catalysts; LANL; Piotr Zelenay*	3.19		X			Quite significant accomplishments were achieved, but there is still a gap between the Pt and the non-precious metal catalyst performances. There needs to be more thought on catalyst cost and catalyst stability in acid.
FC-12	*MEA and Stack Durability for PEM Fuel Cells; 3M; Mike Hicks*	3.36		X			3M presented significant steps forward in membrane degradation and on mapping results of accelerated tests onto unaccelerated lifetimes. They should look at the system operation effect on membrane durability to improve understanding of decay mechanisms and solutions. 3M should perform additional characterization of physical properties and the effect of aging on these properties.
FC-13	*Development of transition metal/ chalcogen based cathode catalysts for PEM fuel cells; Ballard; Stephen Campbell*	2.69		X			Despite good research effort and analytical basis, the activity of the best catalyst for the oxygen reduction reaction was low. Fe and Cr selenides do not look promising, while Co selenide shows a little promise.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-14	*Novel Approach to Non-Precious Metal Catalysts; 3M; Radoslav Atanasoski*	3.09		X			A systematic, combinatorial approach incorporating synthesis of many catalyst samples in the Fe-N-C system. Catalyst activity is still low, despite improvements. Comprehensive approach and good team to cover not only catalyst discovery but also eventual manufacturability.
FC-15	*Novel Non-Precious Metals for PEMFC: Catalyst Selection through Molecular Modeling and Durability Studies; U of So. Carolina; Branko N. Popov*	2.91		X			Looking at Co-based alloys, C precursors, surface modifiers, and Ru alloys for making the non-precious metal catalysts. Good quality data generated. Good approach from a materials viewpoint. Objectives appear to include too many paths to be realistically accomplished with the resources and time allotted. Should include industry collaboration.
FC-16	*Low-Platinum Catalysts for Oxygen Reduction at PEMFC Cathodes; NRL; Karen Swider-Lyons*	3.06		X			Maintain collaborations and connections with industry and other organizations.
FC-17	*Low Pt Loading Fuel Cell Electrocatalysts; Brookhaven Nat. Lab.; Radoslav Adzic*	3.40		X			Solid approach and impressive results. Carry out more fuel cell testing (with cycling) of activity and stability of promising candidate catalysts.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-18	*Development of a Low-Cost, Durable Membrane and MEA for Stationary and Mobile Fuel Cell Applications; Arkema Chemicals; Michel Foure*	2.92		X			Innovative, novel approach to low cost membrane; reasonable polymer chemistry with beginning of life performance; good progress in learning. Inclusion of postmortem failure analysis on samples is good, but durability testing needs to include stress factors. Progress appears to be slow, should consider postponing scale-up. No discussion of membrane morphology. Publish more.
FC-19	*Development of High-Performance, Low-Pt Cathodes Containing New Catalysts and Layer Structures; Superior MicroPowders; Paolina Atanassova*	2.91		X			Well-focused relevant project; expertise in powder synthesis and the collaboration with fuel cell membrane suppliers for characterization activities are strong points; cycle testing is essential. Needs theoretical approach in addition to rapid screening to identify high performance catalyst. Opportunities to alter or modify the carbon support materials should be part of durability studies.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-20	*Platinum Recycling Technology Development; Ion Power, Inc.; Stephen Grot*	3.03		X			Viability of high efficiency recovery of platinum has been demonstrated. Development of a cost model is necessary, as cost should be a primary driver of this project to meet DOE Target. PGMs are a major cost factor in PEMFC, thus recycling is necessary to a sustainable PEMFC industry. Emissions from catalyst combustion needs to be addressed.
FC-21	*Platinum Group Metal Recycling Technology Development; Engelhard; Larry Shore*	2.91		X			Development of emissions free platinum recovery process is viable. Accelerate timeline to drive selection of best approach and focusing of resources. Backup option of pyrometallurgical approach should not be dismissed because of loss of polymer, which is only of marginal value.
FC-22	*Scale-Up of Carbon/Carbon Bipolar Plates; Porvair Corp.; David Haack*	3.02		X			Met DOE's technical targets, and estimate is that cost targets can be met at sufficient volumes. Demonstrated 20-cell stack with performance equal or better to machined graphite. Project will be completed in mid-FY2006 with process/quality control improvements developed and validated.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-23	*Cost-Effective Surface Modification for Metallic Bipolar Plates; ORNL; Karren More for Mike Brady*	3.31		X			Good progress on this project. Focus on cost-effective Fe-Cr alloys next year.
FC-24	*Water Gas Shift Catalysis; ANL; Theodore Krause*	2.65			X		Project discontinued due to shift in focus of fuel processing subprogram.
FC-25	*Catalysts for Autothermal Reforming; ANL; Theodore Krause*	2.68			X		Project discontinued due to shift in focus of fuel processing subprogram.
FC-26	*Selective Catalytic Oxidation of Hydrogen Sulfide; ORNL; Viviane Schwartz*	3.19		X			Good sulfur sorbents have been identified. Need to develop process to regenerate bed.
FC-27	*Cost and Performance Enhancements for a PEM Fuel Cell Turbocompressor; Honeywell; Mark K. Gee*	2.89		X			The incorporation of variable nozzle geometry to flatten efficiency and foil bearings for durability were important steps. Need to increase collaboration with the OEMs. Need to build and test a system. Project to be completed in FY2006.
FC-28	*Development and Testing of a Toroidal Intersecting Vane Machine (TIVM) Air Management System; Mechanology, LLC; Sterling Bailey*	3.11				X	Very novel compressor/expander design. However, the durability of the design is still uncertain since it remains to be analyzed and tested. Device has not been demonstrated that it is capable of high efficiencies promised. Project will be complete at the end of FY2005.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-29	*Development of a Thermal and Water Management (TWM) System for PEM Fuel Cells; Honeywell; Giullermo Pont*	3.03		X			Two humidification designs selected (enthalpy wheel, membrane humidifier) and design and evaluation is continuing. Aerospace and automotive heat exchangers evaluated – AL foam, microchannel and aerospace designs selected. Thermal and water management is essential to compact, reliable, durable fuel cell power systems.
FC-30	*Development of Sensors for Automotive PEM-based Fuel Cells; UTCFC; Brian Knight*	3.06				X	ATMI and NexTech are doing the developmental work. UTC and IIT are testing and evaluating sensors. Project will be completed by September 2005.
FC-31	*2005 DOE Hydrogen Program Sensor Development; Honeywell; Richard Gehman*	1.91			X		With the no-go decision on fuel processing, the chemical sensor work ended at the design stage. Of the remaining physical sensors, the main area of interest was humidity. When it became apparent that work would not meet program objectives and the company no longer had the expertise in-house to continue, research terminated.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-32	*DMFC Prototype Demonstration for Consumer Electronics Applications; MTI MicroFuel Cells; Bob Sievers*	2.51		X			Demonstration and real-world validation of a complete, integrated DMFC system for consumer electronics. High volume manufacturing techniques will be developed to reduce cost to levels appropriate for market entry. Project began in Fall 2004.
FC-33	*DMFC Power Supply for All-Day True-Wireless Mobile Computing; Polyfuel, Inc.; Brian Wells*	2.32		X			The heart of the project is the development of a next generation hydrocarbon membrane that will be engineered to meet the requirements of a DMFC system. Work will be done to miniaturize and integrate the remaining balance of plant components into a package small enough to fit into a laptop computer. Project began in Fall 2004.
FC-34	*Direct Methanol Fuel Cells; LANL; Piotr Zelenay*	3.23			X		Project discontinued to focus R&D efforts on direct hydrogen fuel cells.
FC-35	*Fuel Cell Systems Analysis; ANL; Rajesh Ahluwalia*	3.23		X			Excellent analyses. It would be extremely helpful for fuel cell manufacturers to supply experimental data to validate the models.
FC-36	*Bipolar Plate-Supported Solid Oxide Fuel Cell "Tuffcell"; ANL; J. David Carter*	2.63			X		Project discontinued to focus R&D efforts on direct hydrogen fuel cells.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-37	*Effect of Fuel and Air Impurities on Fuel Cell Performance; LANL; Fernando Garzon*	2.92		X			Consider internally generated impurities such as those from membrane decomposition or bipolar plate corrosion. Steer away from impurities found in reformate. Strengthen ties to the FreedomCAR Codes & Standards Technical Team.
FC-38	*Neutron Imaging Study of the Water Transport Mechanism in a Working Fuel Cell; NIST; Muhammad Arif*	3.52		X			Excellent collaboration with industry, national labs and universities but need to continue to make results of their work publicly available.
FC-39	*Microstructural Characterization of PEM Fuel Cell MEAs; ORNL; Karren More*	3.20		X			Intriguing results. More emphasis needed on post-mortem analysis (can results be quantified?) and characterization of decay mechanisms.
FC-40	*PEM Fuel Cell Durability; LANL; Rodney Borup*	3.85		X			Excellent work. Increased funding for FY2006.
FC-41	*Sub-Freezing Fuel Cell Effects; LANL; Bryan Pivovar*	3.49		X			Excellent start for this project. Increased funding in FY2006. Keep focused on the fundamentals.
FC-42	*Fiber Optic Temperature Sensors for PEM Fuel Cells; ORNL; Tim McIntyre*	3.11		X			Confirm that placement of probes in flow field does not impact measurements.
FC-43	*Research and Development for Off-road Fuel Cell Applications; Idatech; Erik Simpkins*	2.66		X			While the target application will not have a significant impact on reducing oil imports, the program does offer opportunities to make improvements to fuel cell systems that could translate to transportation applications.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FC-44	*50 kW Absorption Enhanced Natural Gas Reformer; ChevronTexaco; Jim Stevens*	2.93		X			Project should continue to improve materials and increase materials durability. Improving purification of the hydrogen stream well above 98% is needed. Sulfur issues should be addressed.
FC-45	*Cost-effective High-efficiency Advanced Reforming Module; Nuvera; Tom Holmes*	2.66		X			System Demonstration will be performed in FY2006. Nuvera should consider more publishing and presenting of their work.
FC-46	*150 kW PEM Fuel Cell Power Plant Verification; UTC; Tom Clark*	3.04		X			Project received good reviews. Future tests should be performed with reformate.
FC-47	*Back-up/Peak-Shaving Fuel Cells; Plug Power; John Vogel*	3.29		X			Excellent work. System will be sent to ANL for independent testing.
FC-48	*Economic Analysis of Stationary PEM Fuel Cell Systems; Battelle; Harry J. Stone*	2.63		X			Battelle will focus on a 50 kW natural gas system. Expand interactions with fuel cell OEMs on values used in the analysis.
FC-49	*Advanced Buildings PEM Fuel Cell System; IdaTech; Kyle Taylor*	2.68		X			Closely monitor alpha system operation, efficiency, and durability, with possible modifications to program based on these results.
FC-50	*Investigating Failure in Polymer-Electrolyte Fuel Cells; LBNL; John Newman*	2.88		X			Premier modeling group. Need to consider anisotropic temperature and gas flow distributions. Also consider other fuel cell designs besides UTC's.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FCP-01	*Montana PEM Membrane Degradation Study; Montana State Univ.; Lee Spangler*	2.78		X			Obtaining voltage signatures for MEA degradation is innovative and interesting. Excellent use of MRI. Good theoretical know-how in three different but supplementary areas. Enthusiastic researchers; should tie data to potential failure mechanisms; light on publications for a university. Lacks collaborations with outside researchers i.e. industry, and adding MEA supplier would be beneficial.
FCP-02	*Development of Higher Temperature Membrane and Electrode Assembly for Proton Exchange Membrane Fuel Cell Device; Oxford Perf. Matls.; Tony DeCarmine*	2.28		X			Initial concept was innovative; PEEKs is chemically and mechanically robust. PI is enthusiastic. Source of SPEKK material is no longer available; may have to look at crosslinking options as membrane has low conductivity and dissolves in water.
FCP-03	*Advanced Fuel Cell Membranes Based on Heteropolyacids; NREL; John Turner*	2.41		X			Next year need to show progress immobilizing the HPA in the ionomer and then demonstrating durability.
FCP-04	*Non-Nafion Membrane Electrode Assemblies; LANL; Bryan Pivovar*	2.99		X			Continue work on H_2/air fuel cells. Address cost benefits of non-Nafion membranes and electrodes.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FCP-05	*Hydrocarbon Membrane; SNL; Christopher Cornelius*	2.86		X			Very promising results at high temperature and moderately low RH. Measure conductivity of new membranes as a function of temperature and RH.
FCP-08	*Cathode Electrocatalysis: Platinum Stability and Non-Platinum Catalysts; ANL; Debbie Myers*	3.05		X			Good work on Pt dissolution. MEA testing of Au will be critical to determine whether to continue the work on Au.
FCP-11	*Modeling and Control of an SOFC APU; PNNL; Mo Khaleel*	3.10			X		Project will not be continued in FY2006 due to programmatic priorities.
FCP-12	*Corrosion Protection of Metallic Bipolar Plates for Fuel Cells; NREL; John Turner*	2.95		X			Check stampability of the stainless steel materials. Need to define timeline and long term plans.
FCP-14	*Fuel Processors for PEM Fuel Cells; U of Michigan; Levi Thompson*	2.18				X	Project is about to end.
FCP-15	*Plate-Based Fuel Processing System; Catalytica; David Yee*	2.73			X		Project terminated based on the DOE On-Board Fuel Processing No-Go Decision. Project will be completed by end of FY2005. Results may have applicability in military applications.
FCP-16	*Application of Advanced CAE Methods for Quality and Durability of Fuel Cell Components; NREL; Ken Kelly*	2.59		X			Focus on more generic research beneficial to all stakeholders. Must find more collaborators beyond Plug Power.
FCP-17	*Residential Fuel Cell Demonstration by the Delaware County Electric Cooperative, Inc.; Delaware Co. Electric Co-op; Mark Schneider*	3.06		X			Congressionally-directed multi-year project. The performance results should be made widely available to the fuel cell community. The energy storage specifics need to be identified.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FCP-18	*Smart Fuel Cell Operated Residential Micro Micro-Grid Community Grid Community; U of S. Alabama; Mohammad Alam*	2.34		X			Congressionally-directed multi-year project. The project is not consistent with the DOE Multi-Year Research, Development, and Demonstration Plan.
FCP-19	*Fuel Cells Vehicle Systems Analysis (Fuel Cell Freeze Investigation); NREL; Ahmad Pesaran*	2.54			X		Fuel Cell program has shifted away from systems to component work.
FCP-20	*Graphite-based Components for Thermal Management in Fuel Cell Systems; ORNL; Edgar Lara-Curzio*	2.74		X			Need to obtain cost projections for various combinations of graphite fibers and weaving and bonding (epoxy) methodologies.
FCP-25	*Fuel Processor R&D; ANL; Shabbir Ahmed*	2.37		X			Focus must be on meeting distributed generation technical targets. Useful to get input from stakeholders.
FCP-26	*Fore Court Fuel Processing; PNNL; Greg Whyatt*	3.03			X		Project discontinued to focus critical R&D efforts on fuel processing for stationary applications.
FCP-27	*Component Benchmarking; LANL; Tommy Rockward*	3.46		X			Outstanding collaborative effort. Expand test plan to include longevity and durability testing.
FCP-28	*Fundamental Science for Performance, Cost and Durability; LANL; Bryan Pivovar*	3.28		X			Continue exploratory work under high pH conditions. Consider transferring reference electrode work to other fuel cell researchers.
FCP-29	*Fuel Cell Testing; ANL; Ira Bloom*	2.56		X			Need to show more test data (which is difficult since companies want to keep info proprietary). At least include an overview table listing what kinds of stacks were tested.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
FCP-30	*Solid Oxide Fuel Cell Development for Auxiliary Power in Heavy Duty Vehicle Applications; Delphi; George Simopoulos*	2.93		X			The project only recently started in September 2004, therefore not much was accomplished prior to the review meeting. The team assembled by Delphi of Volvo and PACCAR will help provide real world perspective and requirements.
FCP-31	*Diesel Fueled SOFC for Class 7/Class 8 On-Highway Truck Auxiliary Power; Cummins; Dan Norrick*	2.99		X			The project only recently started in September 2004, therefore not much was accomplished prior to the review meeting. The team assembled by Cummins of SOFC-EFS and International Truck will provide the required expertise for the project and the ultimate integration into a truck will be a significant accomplishment.
FCP-32	*Fuel Cell APU; UC Davis; Christie-Joy Brodrick*	2.62				X	This project was completed in FY2005.

Technology Validation:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
TV-02	*DTE Energy Hydrogen Technology Park; DTE Energy; Rob Regan*	3.58		X			Project just beginning to produce data. Well-constructed project with very competent team. No additional funds but will be operated through FY2005 after which it will be picked up under a Learning Demonstration in FY2006.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
TV-03	*Hawaii Hydrogen Center for Development and Deployment of Distributed Energy Systems; Hawaii Natural Energy Inst.; Richard Rocheleau*	2.87		X			Project is composite of several different efforts that all include a power park application. New mayor cancelled old reciprocating engine deployment in Honolulu. Big Island of Hawaii is deploying large GE wind turbines. Proceed with biomass and wind projects on the Big Island of Hawaii.
TV-04	*Hydrogen Power Park - Business Opportunities Concept Project; Pinnacle; Raymond Hobbs*	3.52		X			Significant data presented from a myriad of projects. Very credible set of business plans in place. No additional funds required but will include wood chip gasifier and wind electrolysis projects in FY2005.
TV-05	*Validation of an Integrated System for a Hydrogen-Fueled Power Park; Air Products; Greg Keenan*	2.59		X			Project had range of reviews from 1) excellent project that investigates attractive co-production option to meet DOE targets to 2) a waste of tax payer dollars on existing patented technology. No additional funds required in FY2005 as it is part of APCI California Highway Initiative.
TV-06	*Novel Compression and Fueling Apparatus to Meet Hydrogen Vehicle Range Requirements; Air Products; Todd Carlson*	2.97				X	Project has identified an acceptable fluid for this application. APCI has made a Go decision to include at a refueling station.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
TV-07	*Controlled Hydrogen Fleet & Infrastructure Analysis; NREL; Keith Wipke*	3.41		X			Test protocols established and data center established to handle sensitive data. Supports Controlled Hydrogen Fleet & Infrastructure Demonstration effort.
TV-08	*California Hydrogen Infrastructure Project; Air Products; Mark Pedersen*	2.61			X		Congressionally-directed project. Reviews ranged from looking at many potential projects important to DOE to needs focus and introduction of cost effectiveness methodology to narrow the number of options being considered. No additional funds for earmark project in FY2006.
TV-09	*Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project; DaimlerChrysler; Klaus BonHoff*	3.47		X			Excellent team and important effort for DOE to get valuable data. Continue Learning Demonstration Project.
TV-10	*Hydrogen Fuel Cell Vehicle & Infrastructure Demonstration Program Review; Ford; Greg Frenette*	3.63		X			Excellent team and important effort for DOE to get valuable data. Continue Learning Demonstration Project.
TV-11	*Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project; Chevron Texaco; Rajesh Paulose*	3.34		X			Excellent team and important effort for DOE to get valuable data. Continue Learning Demonstration Project.
TV-12	*Hydrogen Vehicle and Infrastructure Demonstration and Validation; General Motors; Roz Sell*	3.54		X			Excellent team and important effort for DOE to get valuable data. Continue Learning Demonstration Project.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
TVP-01	*Hydrogen from Biomass for Urban Transportation; Clark Atlanta Univ.; Kofi Bota*	2.67		X			Project completed 200 hour tests but needs to operate for 1000 hours to complete validation of concept. $50,000 needed to complete 1000 hour validation test.
TVP-02	*Chattanooga Fuel Cell Demonstration Project; City of Chattanooga; Joe Ferguson*	2.32			X		Project suffers from assuming that there are no problems and the system will operate. Poor team research capability. No additional funds for earmark project in FY 2005.
TVP-04	*Power Parks System Simulation; SNL; Andy Lutz*	3.61		X			Excellent support for Power Park Projects with knowledgeable investigator.
TVP-05	*Technology Validation: Fuel Cell Bus Evaluations; NREL; Leslie Eudy*	3.28		X			Very good support analysis of bus projects and converting them to Learning Demo protocols.
TVP-06	*Auto-Thermal Reforming Based Refueling Station at SunLine; HyRadix/SunLine; John Harness*	2.96				X	Project completed and they are successfully marketing the technology.
TVP-08	*Hydrogen Filling Station; UNLV; Robert Boehm*	2.64			X		Congressionally-directed project. Need to make more progress on completing station and providing vehicles for use by the station.
TVP-11	*Hydrogen and Natural Gas Blends: Converting Light and Heavy Duty Vehicles; Collier Techs.; Neal Mulligan*	2.34				X	Las Vegas has converted 9 trucks to Hythane, and emissions are less than SULEV. Future conversions will be completed commercially and will add to the demand for hydrogen infrastructure. Recommend no further funding for this activity.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
TVP-12	*Fuel Cell Powered Underground Mine Loader Vehicle; Vehicle Projects LLC; David Barnes*	2.62			X		Congressionally-directed project. Good integration project in a marketplace where fuel cells might be competitive. Excellent collaboration. Not clear of project's significance to light duty vehicle program. Needs FY2005 funds from earmark to complete.
TVP-14	*Hydrogen Transition Infrastructure Analysis; NREL; Margo Melendez*	2.49				X	Analysis completed. Looks like government effort but needs industry input or effort will be ignored. GIS is effective tool and is an innovative approach. New case studies will be funded by Analysis to NREL with closer collaboration with industry. Important part of transition analysis.

Safety, Codes and Standards:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
SA-02	*Hydrogen Codes and Standards; NREL; Jim Ohi*	3.21		X			Project provides valuable input to the codes and standards process; will increase focus on hydrogen quality.
SA-03	*Research and Development for Hydrogen Safety, Codes and Standards; SNL; Jay Keller*	3.61		X			R&D role is critical as input to the codes and standards effort. Work will continue to shift toward experiments that examine real world risks.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
SA-04	*International Standards and Regulations; LANL; Cathy Padro*	2.69		X			International codes and standards activity and harmonization critical, but not clear the extent to which this activity helps this difficult process. Should increase coordination with DOT.
SA-05	*HAMMER Emergency Response Training for the Hydrogen Economy; PNNL; Bruce Kinzey*	2.96		X			Important activity, but will be difficult to implement training of very large number of people. In FY2006, training activity will be funded by the Education program element; this element will support development of training facilities.
SA-06	*Hydrogen Safety Review Panel; PNNL; Steven Weiner*	3.20		X			Overall Panel expertise is good, but the workload is high and impact on safety is hard to gauge.
SAP-01	*IEA Hydrogen Task 18: Evaluation of Integrated Demonstration Systems; Longitude 122 West, Inc.; Susan Schoenung*	3.41		X			Good to share this data and analysis – the overall focus is correct. However, the differing size and configurations of the projects makes it difficult to compare data.

Education:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
ED-02	*Hydrogen/Alternative Energy Center; Lansing Comm. College; Ruth Borger*	2.94		X			FY2004 Congressionally-directed project. Should be completed in FY2006 with no additional funding required.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
ED-03	*Shared Technology Transfer Project; Nicholls State Un.; John Griffin*	1.83		X			FY2004 Congressionally-directed project. Should be completed in FY2006 with no additional funding required.
ED-04	*Montana Hydrogen Futures Project; U. of Montana; Paul Williamson*	2.54		X			FY2004 Congressionally-directed project. Should be completed in FY2006 with no additional funding required.
ED-05	*Hydrogen Technology and Energy Curriculum (HyTEC); U of Cal. Berkeley; Barbara Nagle*	3.46		X			Continue funding in FY2006. Build on partnerships and use established network for widespread dissemination and to extend project reach.
ED-06	*H2 Educate!; NEED; Mary Spruill*	3.66		X			Continue funding in FY2006. Build on partnerships and use established network for widespread dissemination and to extend project reach.
EDP-01	*Baseline Knowledge Assessment; ORNL; Tim Armstrong*	3.30		X			Disseminate survey results as widely as possible. Plan for follow-on surveys in out years.
EDP-02	*Hydrogen Technology Overview Publication and Program Information Kit; Andersen Creative; Cindi Andersen*	2.14		X			Continue to support. Coordinate with other educational materials development projects to ensure comprehensive coverage and avoid duplication. Disseminate widely.
EDP-03	*Understanding the Hydrogen Economy; Energy & Envr. Analysis; Rick Tidball*	2.83		X			Continue to support. Coordinate with other educational materials development projects to ensure comprehensive coverage and avoid duplication. Disseminate widely.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
EDP-04	*Hydrogen Education and Outreach; NHA; Patrick Serfass*	3.58		X			Continue to support. Coordinate with other educational materials development projects to ensure comprehensive coverage and avoid duplication. Support from industry partners and leverage current product distribution plan.
EDP-05	*Hydrogen Technology Learning Centers; STAC; Bob Kripowicz*	2.71		X			Continue to support. Focus on collaboration among the three learning centers.

Analysis:

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
AN-02	*Moving Toward Consistent Analysis in the HFC&IT Program: H2A; NREL; Maggie Mann*	3.68		X			The first phase of the project was presented at the Merit Review and received a high approval rating. The second phase of the project is being funded in FY2005 and will continue to be funded in FY2006.
AN-03	*Hydrogen Transition Modeling and Analysis: HYTRANS v. 1.0; ORNL; David Greene*	3.27		X			This project is a co-funded project with PBA. The project should continue since it will be a useful model for transitional analysis. The model is planned to be linked to the Macro System Model which is under development.

Project No.	Project title, Performing Org	Final Score	New	Continued	Dis - continued	Project Completed	DOE Summary Comment
AN-04	*WinDS-H2 Model and Analysis; NREL; Walter Short*	2.91	X				This is a new project which uses the past work on the WinDS model for the new project basis. The project startup was delayed due to funding, which is reflected in the lower score. This project will provide an optimization tool for future hydrogen infrastructure and production analysis. The model will include renewable hydrogen production pathways in the model structure.
AN-05	*Technical and Economic Studies of Regional Transition Strategies toward Widespread Use of Hydrogen Energy; UC Davis; Joan Ogden*	3.27	X				This project is useful for the infrastructure development and builds on some of the past UC Davis projects. The project started late due to funding delays. Also, the funding for the project was reduced due to Congressional earmarks. The project is planned to continue in FY2006.
AN-06	*Fuel Choice for FCVs: Hydrogen Infrastructure Costs; TIAX LLC; Stephen Lasher*	3.16		X			This project provides valuable information about renewable resources and their values. This project is an extension of an existing project. The funding for this project was delayed resulting in a delay in startup.
ANP-01	*Hydrogen Production in a GHG-Constrained Situation: Major Results & Conclusions; Tellus; Bill Dougherty*	2.75				X	This project was funded by the Production Subprogram. The project is complete.